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(54) Self tightening drill chuck

(57) The chuck has jaws (16) which are opened and closed by a jaw carrier (40) moved axially by a screwthreaded operating rod (26) to which drilling torque is transmitted from the power tool driving spindle. The rod (26) is integral with a rear housing part (22) with e.g. a screwthreaded coupling (24) with the tool spindle. The jaws are carried in a forward housing part (10, 20).

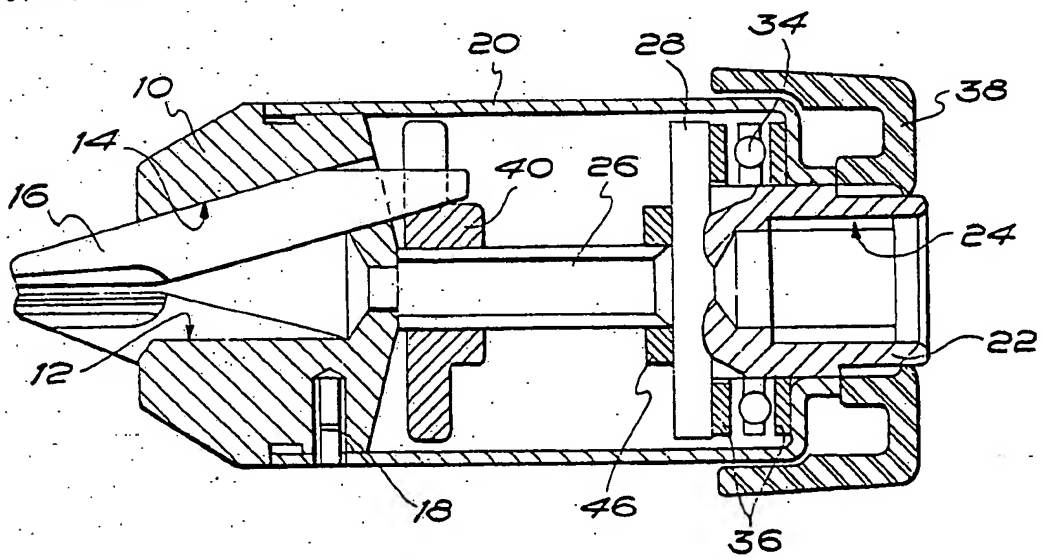

FIG. 1

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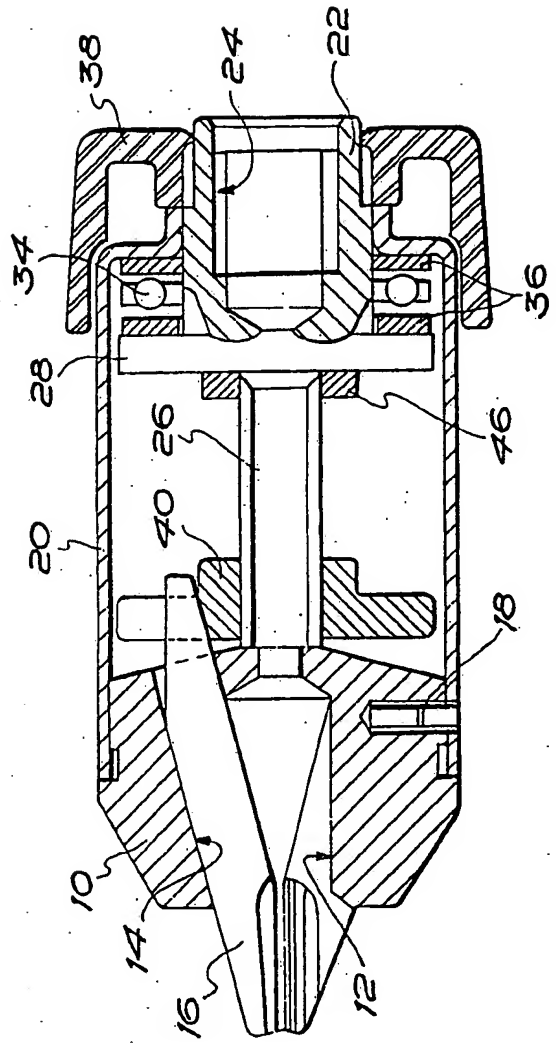

FIG. 1

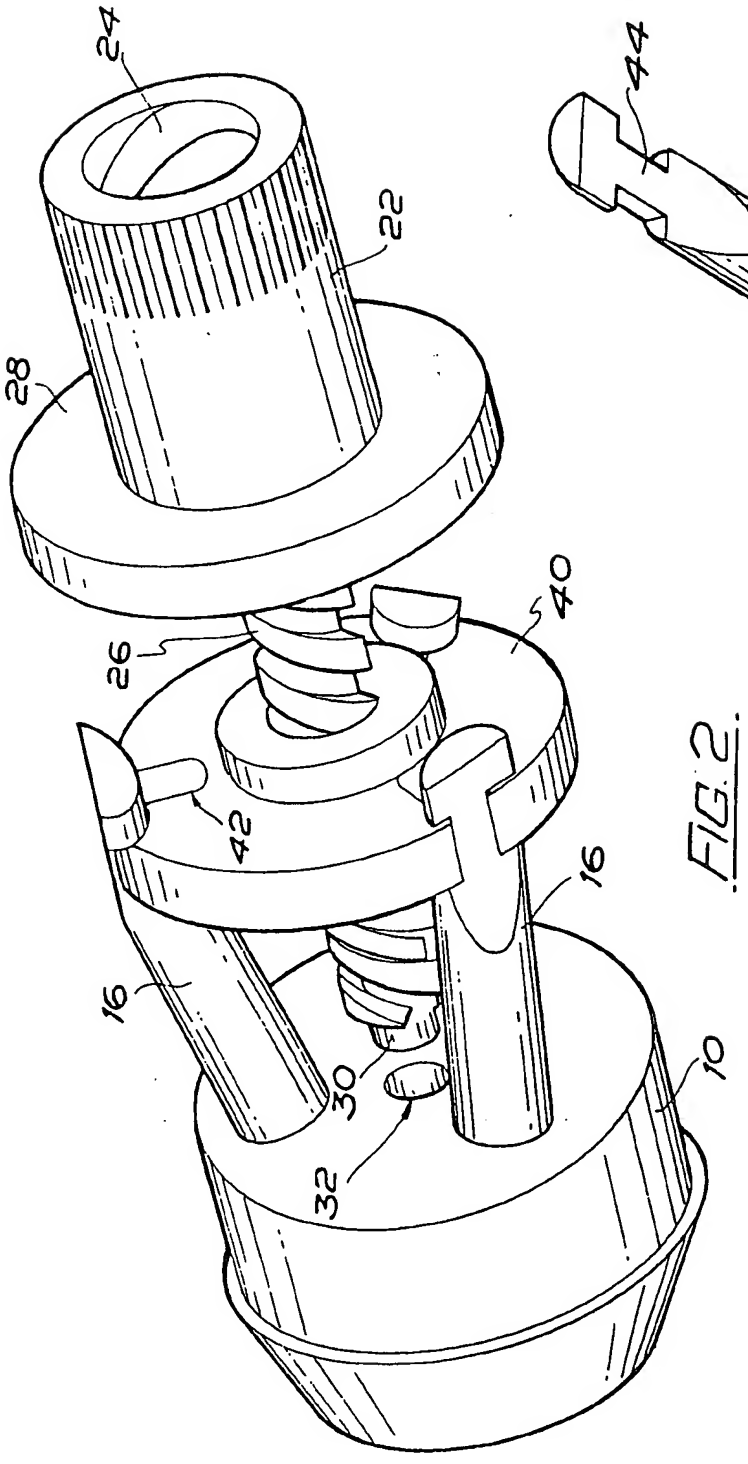

FIG.2.

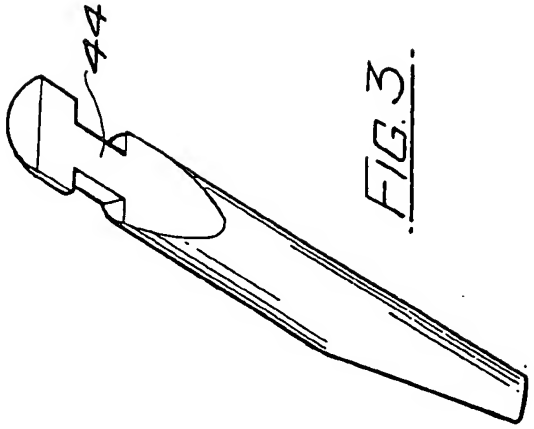

FIG.3.

Drill chucks.

The invention relates to a drill chuck for holding a twist drill to be used in a hand held power drill or in a machine tool for example.

In a drill chuck of the kind concerned, a body part of the chuck has jaws which are slidably mounted in respective bores and can be advanced so that they converge to grip a drill shank between parallel end portions.

Various operating mechanisms have been proposed whereby the jaws can be advanced or retracted as required. For example, a nut member has been rotatably mounted on the body part and located in a circumferential groove in the body part to have screwthreaded engagement with the jaws. In this case, a bevel gear element, either connected to or formed integrally with the nut member, has been provided for rotating said nut member, the bevel gear element being able to be engaged by a bevel gear pinion portion of an extraneous chuck key a pilot end of which has been able to be received in any one of a number of equally spaced radial blind bores in the body part. However, such a mechanism, although working very well, is somewhat expensive to produce. The object of the invention is to

provide a drill chuck the operating mechanism of which can be provided at a lesser cost than hitherto.

According to the invention, there is provided a drill chuck including a forwardly located body part which constitutes a nose cone part of the chuck, said body part being formed with an axially extending bore for the reception of a drill shank and with three equally spaced bores which diverge from the axially extending bore for the reception of respective jaws which are slidable therein and can be advanced so that they converge to grip a drill shank between parallel end portions, the drill chuck also including a rearwardly located body part adapted for connection to a power tool driving spindle and means for axially locating the rearwardly located body part relative to the forwardly located body part, said rearwardly located body part being provided with a screwthreaded operating rod which has screwthreaded engagement with a jaw carrier to which end portions of the jaws are connected, the arrangement being such that the advancing or retracting of the jaws to bring about initial gripping of a drill shank, or to release a drill shank which is to be removed from the chuck, is effected by manual rotation of

the rearwardly located body part relative to the forwardly located body part, but by virtue of the drilling torque being transmitted from the power tool driving spindle to the rearwardly located body part and then through the operating rod to the jaw carrier, the drilling action tends to advance the jaws even further with the result that they are forced further into gripping engagement with the drill shank. The jaw carrier will preferably be formed with three equally spaced slots extending radially inwards from its periphery, the ends of the jaws being notched so that necked portions thus produced are a close sliding fit in said slots. The means for axially locating the rearwardly located body part relative to the forwardly located body part may include a generally cylindrical sleeve fixedly connected at one end to the forwardly located body part and at its other end bearing against a disc portion of the operating rod through a thrust bearing. The manual rotation of the rearwardly located body part relative to the forwardly located body part will preferably be facilitated by a lockring connected to the rearwardly located body part and having a skirt portion closely embracing an end portion of the generally cylindrical sleeve.

In order that the invention may be fully understood and readily carried into effect, the same will now be described, by way of example only, with reference to the accompanying drawings, of which:-

Figure 1 is a longitudinal section through a drill chuck embodying the invention,

Figure 2 is a perspective view which illustrates its operating mechanism, and

Figure 3 is a scrap view which illustrates the form of the chuck jaws.

Referring now to the drawings, the drill chuck there illustrated includes a forwardly located body part 10 which constitutes a nose cone part of the chuck. Said body part is formed with an axially extending bore 12 for the reception of a drill shank (not shown) and has three equally spaced bores 14 which diverge from the axially extending bore for the reception of respective jaws 16. The jaws are slidably mounted in their respective bores and can be advanced so that they converge to grip a drill shank between parallel end portions. They can also be retracted into the forwardly located body part to release the drill shank.

The forwardly located body part 10 is connected, by means of three equally spaced pins 18, to a

generally cylindrical sleeve 20 which at its end remote from said body part is inwardly swaged to closely embrace a rearwardly located body part 22 which is formed with an internally screwthreaded recess 24 by means of which the drill chuck can be connected to a power tool driving spindle (not shown).

The rearwardly located body part 22 is formed integrally with a screwthreaded operating rod 26 and with a disc portion 28. A projecting stud portion 30 of the operating rod is located in an axial hole 32 in the forwardly located body part 10. The disc portion 28 is arranged to bear against the swaged-down end wall of the sleeve 20 through a thrust bearing 34. A pair of hardened and ground washers 36,36 flank the thrust bearing, as shown. A lockring 38, which is made of a synthetic plastics material, is shown in Figure 1 to have been press fitted on a serrated outer end portion of the rearwardly located body part 22. A skirt portion of the lockring, which has a serrated peripheral surface, closely surrounds an end portion of the sleeve 20, portions of which are also serrated, for non-slip manual gripping of the two parts.

The operating rod 26, which is formed with a left hand thread, has screwthreaded engagement with a jaw carrier 40 to which end portions of the jaws 16 are connected, as best shown in Figure 2. As shown, a flat disc-like portion of the jaw carrier is formed with three equally spaced slots 42 which extend radially inwards from its periphery. The ends of the jaws are notched, as shown in Figure 3, and the necked portions 44 thus produced are a close sliding fit in the slots 42. It will also be seen in Figure 3 that the notched ends of the jaws are chamfered off in such a way that radially outer surfaces of the jaws in the assembled chuck are parallel to the internal wall surface of the cylindrical sleeve 20.

The arrangement is such that the rotation of the rearwardly located body part relative to the forwardly located body part effects the movement of the jaw carrier longitudinally of the operating rod (in a direction dependent on the direction of relative rotation), because of course it will be understood that the jaw carrier is held against rotation by its engagement with the jaws. The limits of such movement are the position in which the jaw carrier is shown in Figure 1, in which position the jaws are fully advanced, and a

position in which the jaw carrier abuts against a synthetic plastics washer 46 which is shown in abutment with the disc portion 28. As such movement of the jaw carrier takes place, the jaws are advanced or retracted to a corresponding extent and the necked portions of the jaws slide radially inwardly or radially outwardly along the respective slots 42 in the jaw carrier.

The advancing or retracting of the jaws to bring about initial gripping of a drill shank, or to release a drill shank which is to be removed from the chuck, is effected by manual adjustment of the lockring relative to the sleeve 20 as described above. However, it is a particular feature of the chuck that it is self-tightening on the drill shank concerned during a drilling operation. This is because drilling torque is transmitted from the power tool driving spindle to the rearwardly located body part 22 of the chuck and then through the operating rod 26 to the jaw carrier. Since the operating rod has a left hand thread, the drilling action tends to advance the jaws even further with the result that they are forced further into gripping engagement with the drill shank concerned. Frictional forces within the chuck which might dissipate to some extent the self-tightening effect

just described are kept to a minimum, for example by the presence of the thrust bearing 34 between the disc portion 28 and the end wall of the sleeve against which it acts.

Thus there is provided a drill chuck the operating mechanism of which can be provided at a lesser cost than hitherto and which in addition does not require a key and is self-tightening in operation. However, various modifications may be made. For example, although it is important that internal friction should be as low as possible, the thrust bearing 34 could probably be replaced by a low friction washer. Furthermore, the rearwardly located body part need not necessarily be formed with a screwthreaded recess by means of which it can be connected to a power tool driving spindle. It could instead be provided with a screwthreaded spigot portion or even with a taper or parallel type of fitting if required.

It will be undertood that in the chuck described and illustrated the means provided for axially locating the rearwardly located body part relative to the forwardly located body part are constituted by two separate parts, that is to say the screwthreaded operating rod which is in compression during a drilling operation and the cylindrical

sleeve which is in tension during a drilling operation. However, if the screwthreaded rod could be axially fixed relative to the forwardly located body part, by some means capable of withstanding the considerable forces imposed when "snatch" of the drill bit takes place when drilling through sheet metal for example, it would be possible to eliminate the thrust bearing 34 or other means for absorbing tensile forces in the sleeve. Tensile forces would then be confined to the section of operating rod between the jaw carrier and the forwardly located body part.

CLAIMS:

1. A drill chuck including a forwardly located body part which constitutes a nose cone part of the chuck, said body part being formed with an axially extending bore for the reception of a drill shank and with three equally spaced bores which diverge from the axially extending bore for the reception of respective jaws which are slidable therein and can be advanced so that they converge to grip a drill shank between parallel end portions, the drill chuck also including a rearwardly located body part adapted for connection to a power tool driving spindle and means for axially locating the rearwardly located body part relative to the forwardly located body part, said rearwardly located body part being provided with a screwthreaded operating rod which has screwthreaded engagement with a jaw carrier to which end portions of the jaws are connected, the arrangement being such that the advancing or retracting of the jaws to bring about initial gripping of a drill shank, or to release a drill shank which is to be removed from the chuck, is effected by manual rotation of the rearwardly located body part relative to the forwardly located body part, but by virtue of the

drilling torque being transmitted from the power tool driving spindle to the rearwardly located body part and then through the operating rod to the jaw carrier, the drilling action tends to advance the jaws even further with the result that they are forced further into gripping engagement with the drill shank.

2. A drill chuck according to claim 1, in which the jaw carrier is formed with three equally spaced slots extending radially inwards from its periphery, the ends of the jaws being notched so that necked portions thus produced are a close sliding fit in said slots.

3. A drill chuck according to either one of the preceding claims, in which the means for axially locating the rarwardly located body part relative to the forwardly located body part include a generally cylindrical sleeve fixedly connected at one end to the forwardly located body part and at its other end bearing against a disc portion of the operating rod through a thrust bearing.

4. A drill chuck according to any one of the preceding claims, in which the manual rotation of the rearwardly located body part relative to the forwardly located body part is facilitated by a lockring connected to the rearwardly located body

part and having a skirt portion closely embracing an end portion of the generally cylindrical sleeve.

5. A drill chuck constructed, arranged and adapted to operate substantially as hereinbefore described with reference to and as illustrated by the accompanying drawings.